The Boston Medical and Surgical Journal

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February 16, 1922

The New England Surgical Society

INFECTIONS OF THE BILIARY PASSAGES.

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IT is not intended that this paper should offer anything new on the subject in question. It is hoped that it will set forth the gist of present-day opinion with regard to infection of the biliary tract and the influence of that opinion upon our present-day methods of treatment. Infection has always played an important part in the etiology of surgical disease; nevertheless, it is only in relatively recent years that we have arrived at a thorough, accurate, appreciative knowledge of its causative relation to and its method of action in many affections of such organs as the stomach, the appendix and the biliary apparatus, all deeply placed in the body and yet all more or less directly connected with the body-surface through channels lined with mucous membrane. In so far as the biliary apparatus is concerned, the patency of the fact that it is thus connected with the body-surface probably furnished the chief reason why we came at so late a day to a correct idea of the common path followed by infection on its journey to the gall-bladder and associated ducts. Some few years ago Naunyn, the internist, in his studies of biliary disease, emphasized the fact that the presence of jaundice when there are no stones in the hepatic or common ducts, and its possible absence with even a good-sized stone in the common duct, demanded for its explanation some more constant factor than the mere presence or absence of a stone. This factor, he insisted, was infection of the ducts with the consequent swelling and edema of the mucous membrane. He believes that the pathological changes seen in the biliary tract are the result of its reaction to bacterial injury, and that gallstones are incident and not essential in the process. The non-calculous stage of biliary infection has not received the attention to which its importance entitles it and the calculous phase has had too much. In this country the work of Billings and John B. Murphy on focal infections, the infection of organs and portions of the body from remote foci, was a considerable step in advance and prepared the way for the remarkable studies of Rosenow who had ably demonstrated the elective localizing power of certain bacteria in so-called harmless chronic infections (tonsillitis, infected dental roots, sinusitis, etc.) and has shown the striking importance of such foci as sources of the hematogenous infection of distant organs, among others the gall-bladder.

Rosenow's[1] work is of basic importance and a consideration of even that portion of it which has to do with the gall-bladder is of great interest and value. If there is injected directly into the lumen of the gall-bladder streptococci already proven to have an affinity for the gall-bladder when injected intravenously, infection

of the organ does not follow. It has long been known that normal mucous membrane affords marked protection against the invasion of bacteria. Some other factor aside from trauma or an area of lowered resistance, both usually so necessary for local infection, must be adduced to explain the place of localization of bacteria after entrance into the blood stream, and that factor, Rosenow shows, is a quality inherent in some strains of bacteria themselves, a peculiar affinity for localizing and producing lesions in certain organs. Certain strains of streptococci tend to localize and produce lesions in organs corresponding to those affected in the person from whom they were isolated. For instance, eighty per cent. of forty-one animals injected with strains from cholecystitis developed lesions in the gall-bladder. It was shown experimentally that streptococci in infected tonsils and teeth may have elective localizing power, and Rosenow wisely calls attention to clinical facts corroborating the causal relationship between a focus of infection and disease in distant organs. We, ourselves, I think, can recall from our experience the increased incidence of acute appendicitis, acute renal infections and exacerbations of symptoms of duodenal ulcer in epidemics of acute throat infections. In further support of the causal relationship let Rosenow tell of a case seen by both the clinicians and the laboratory men at the Mayor Clinic; it affords a very striking commentary on his own ideas and for that reason is worthy of brief report. A patient complaining of distress after eating, repeated attacks of moderately severe pain in the epigastric region and to the right of it, recurring attacks of diarrhoea, and marked loss of weight—symptoms of chronic cholecystitis without stones—showed on general examination only slight tenderness in the right hypochondrium. Two devitalized, abscessed teeth were removed and a small collection of pus in the upper jaw was drained without perceptible effect on the patient. Six months later, the tonsils were removed and a return to health followed. The primary cultures from the tonsils were injected into four animals. One animal died suddenly and the others were chloroformed at the end of forty-eight hours. Autopsy showed lesions of the gall-bladder, pancreas and the acid-forming portion of the stomach in all four animals. The gall-bladder and the pancreas were hemorrhagic and edematous. Streptococci isolated from the fluid about the pancreas of one dog were injected into a dog and a pregnant cat. Marked lesions of the gall-bladder and the pancreas developed in both. The cat aborted and the foetus showed pancreatic hemorrhages. Cultures from the lesions in the pancreas of the foetus, in the pancreas and gall-bladder of the mother cat and of the pancreas and the gall-bladder of the dog, yielded the streptococcus injected. It seems to me that the deductions from this case are so logical as to need no comment. In the light of our present knowledge, we must accept as true the conclusions of Rosenow.

Furthermore, it is interesting to the surgical clinician to note that Rosenow found a relatively high incidence (21%) of lesions in the gall-bladder following injection of strains of streptococci from gastric and duodenal ulcer and in the stomach and duodenum (29%) following the injection of gall-bladder strains; this finding suggests that the common association of these two lesions in man may also be due to embolic infections by bacteria having affinity for the structures involved. On the other hand, one is struck by noting that in seventeen strains from the appendix 70% of the animals developed appendicitis and in that series, while 11% showed gastric or duodenal lesions also, only 1% developed lesions of the gall-bladder.

It seems safe to assume, then, that the chief cause of infection of the biliary tract is the streptococcus and that it is borne thither by the blood current from a distant focus. The streptococcus, the staphylococcus, the typhoid bacillus, the bacillus of influenza and the colon bacillus have all been found in infected bile. It is Rosenow's belief, however, that though the elective localizing power of the colon bacillus has been occasionally demonstrated both in cholecystitis and appendicitis, it is usually a secondary though important invader in cholecystitis. The importance of the rôle played by the typhoid bacillus is so well known as to need only mention. Graham[2] of Toronto recovered the staphylococcus from the gall-bladders only of such patients as gave a clinical history of mucous colitis in varying degrees of severity, but he considers the lesion in the gall-bladder the primary one. Deaver[3] and many others have preached the causal relationship of appendiceal inflammations to those of the gall-bladder, this infection probably taking place through the portal circulation. Furthermore, the passage of infectious agents from the bowel to the liver by way of the venous and lymphatic systems, and their elimination through the bile, has been advanced as an explanation of the frequent association of gall-bladder disease, duodenal ulcer and appendicitis (Kelling[4]).

Graham[5] of St. Louis has noted the almost constant association of hepatitis with cholecystitis. There is an intimate lymphatic connection between the liver and the gall-bladder; the inflammatory process is often older in the former than in the latter and the path of infection may thus conceivably be from the liver to the gall-bladder. Judd,[6] however, believes that such an occurrence, though possible, must be rare. The gall-bladder is in such intimate juxtaposition to the liver that the mere juxtaposition may explain the coexistence of inflammatory processes in both. We have all seen at

the operating table evidences of hepatitis (usually well localized, occasionally widespread and scattered), when we have been dealing with lesions of the gall-bladder. But we have also met with many instances where no gross lesion of the liver was present. It is well to remember, however, that a microscopic examination is frequently necessary to demonstrate the hepatitis. In a corresponding way, the gall-bladder itself may be entirely innocent in appearance and normal to the eye, and even may be sterile to surface or bile culture and yet show in sections, under the microscope, unmistakable round-cell infiltration, the sure sign of a preceding inflammatory process. I have often wondered what a section of the wall of the common or hepatic ducts would show under the microscope in cases in which they grossly appear within the limits of normality. In other words, are these changes due to inflammation limited to the gall-bladder wall, or are the duct walls also implicated in the process? The true answer to this question might influence our ideas as to treatment.

Infection, then, may reach the gall-bladder along various paths; through the systemic circulation, the portal circulation, the lymphatic system, through juxtaposition and by way of the common duct.

The possibility of infection reaching the gall-bladder by way of the common duct is doubted by many, and my own opinion is that, while such an occurrence is possible, it is by no means common. We have all seen cases of acute, almost fulminant cholecystitis with the tense, reddish-purple, distended, edematous gall-bladder and a common duct that seems to be entirely normal. However, the conditions are not always thus. We know the increased incidence of acute cholecystitis in the corn, shore-dinner season; we are all acquainted with the acute gastroenteritis that usually precedes or accompanies it. If the sphincter at the papilla of Vater functions under normal condition, I think infection of the gall-bladder through the duct is very uncommon; if, however, it has to function under such abnormal conditions as may be present with acute gastroduodenitis, duodenal ulcer, etc., then the mechanism of the papilla may well be disturbed by the irritation, the bile, often in a condition of stasis in the duct, may become infected and this infection may thus reach the gall-bladder itself.

Once infection has reached the biliary tract, how does it act? It may work in such a way as to produce that acute inflammation of the gall-bladder with which we are all so familiar that no time will be given to its consideration in this paper. The lesions are usually at least partially destructive in character and occasionally lead to perforation. Though a case now and then may produce so acute a toxemia as to be lethal, the primary acute attack, even though it may be very severe, is only rarely fatal, and many cases recover without any surgical interference whatever. The great danger, of course, lies in the fact that it prepares the ground for future trouble—the recurrent acute attack of chronic inflammatory disease of the gall-bladder and ducts with its long line of sequences, near and remote.

Nor is any pretension made to offer here an adequate discussion of the possible results of chronic infection of the gall-bladder. A brief résumé will be offered and the sequences will be discussed in the order they come to the reader's mind and not, perhaps, in the order of their importance.

1. The wall of the gall-bladder itself is damaged and may become grossly thickened and greatly crippled in its function. All gradations of chronic infection may be seen, ranging from the impalpable process, imperceptible to the naked eye, to the stage marked by minute, papillomatous outgrowths from the mucous membrane, to that indicated by the so-called "strawberry" mucous membrane, even to the last stage — a contracted, functionally useless but still dangerous remnant of an organ. The neighboring lymphatic vessels are thickened and engorged and the glands infiltrated and enlarged.

2. Moreover, the chronically inflamed gall-bladder must be regarded as a source of toxic absorption. Degenerative changes in other organs (the myocardium for example), arthritis, hepatitis with disturbances of the liver function, anaemia, and a general condition of lowered resistance, are possible results. The derangement of liver function may assume new importance through the recent work of Crile which he himself says is at present suggestive rather than conclusive. The infection, the diminished nutrition, the loss of water equilibrium due to the nausea of jaundice, the lowered blood pressure and the back pressure of the bile, all predispose to "liver shock" with its deleterious effects on the brain cells—a possible factor in raising the mortality of gall-bladder surgery under the usual conditions of anaesthesia. The opinion that an infected gall-bladder may be one of the causes of duodenal ulcer is not without its supporters. Graham, already quoted, thinks that there is some ground for regarding it as a forerunner of mucous colitis also. To this load, already great, must be added jaundice, that undesirable expression of the presence of bile in the blood stream.

3. Pancreatitis. This sequence of chronic biliary infection is only mentioned, since it has been adequately dealt with by Dr. D. F. Jones at this session. An acute pancreatitis is very evident to palpation at operation: equally so would be the advanced case of chronic pancreatitis, were it not for the fact that it is often impossible to distinguish it from malignancy.

It is in the beginning and early cases of chronic pancreatitis that difficulty arises. The pancreas normally is a firm organ; perhaps one would not call it hard. When the firmness exceeds normal, chronic pancreatitis has begun. Surgeons differ in the sensitiveness of their palpation as well as in their ideas of the normal degree of firmness; hence arises the variance in the report of percentages of chronic pancreatitis in biliary infection. Each man is more or less a law unto himself.

4. Cholelithiasis. Chronic cholecystitis may exist with or without stones. Stones may be formed in sterile bile, but it is certain that the great majority of gall-stones are the result of infection. I believe that most of them are formed in the gall-bladder but, unwelcome tenants as they are even there, unlike the usual unwelcome tenant, they are prone to move. They pass on into the ducts and are always, whether in the bladder or in the ducts, potential if not actual sources of danger and harm. They are free to cause ulceration and stricture and obstruction anywhere in the biliary passages, with all the troubles that these portend, or to perforate into the intestinal tract with a possible similar effect there. They furnish the chronic local irritation that may give rise to future cancer. It is said that in 95 per cent. of primary cancer of the gall-bladder, stones are present. They increase the severity of any recrudescence of inflammation and they are exciters of unpleasant reflex phenomena. They, too, may lead to jaundice.

5. Reflex sequences. Of all the viscera, the stomach is the one that participates most, at least symptomatically, in the pathology of the biliary apparatus. Pylorospasm, with its attendant disturbances of gastric motility, and certain changes in the chemistry of the gastric secretion are common accompaniments of an infected gall-bladder either with or without stones.

6. The formation of adhesions. It is certain, of course, that cholecystitis, either in the acute or in the chronic form, tends to the formation of adhesions which in some instances are extensive. These may, without doubt, at times give rise to some discomfort, but I am inclined to agree with Deaver that, in the absence of renewed infection or of mechanical obstruction (which, I believe, is very rare in this field), they are usually harmless. As in other localities, so in the biliary region adhesions are blamed for many things of which they are really innocent. Of themselves, they seldom cause severe symptoms. Their possibilities for doing harm must, however, be borne in mind.

Symptoms. Before such a gathering as this it is not necessary to discuss at length symptoms of either acute or chronic biliary infection. As far as the acute form is concerned, the symptoms are classic and known to you all. In passing, let me call attention to a type of acute biliary infection spoken of by the late John B. Murphy.[7] It is characterized mainly by what he terms the "temperature angle of cholangic infection," which he differentiates from the usual temperature curve of such infections. It is due to an inflammation of the gall-bladder and may exist without jaundice, without pain, without a history of colic and without the usual easily elicited tenderness in the right hypochondrium; recurrent attacks of chills and fever—the old-fashioned "ague"—may be practically the only symptom. A chill occurs, the temperature rises very sharply to 105°–106°, remains high for three to four days and then drops to a normal range, where it continues for from ten days to two weeks, when another sudden exacerbation of temperature with a chill ensues. According to Dr. Murphy, these patients during the acute stage are always sensitive to perpendicular percussion and to deep pressure with the fingers hooked beneath the right costal border; that fact, together with the striking temperature angle, clinches the diagnosis. I have never recognized such a case. I mention Dr. Murphy's description of the typical case in an educational way, because he was so very able a clinician and because, in the event of chills and fever occurring without evident cause, possible infection of the gall-bladder may be brought to your minds.

The symptoms of chronic cholecystitis are usually those which go to make up the symptom-complex commonly known to the laity as "dyspepsia" or "indigestion." They are as varied, of as many colors, apparently as indefinite and as wandering as the patients who complain of them. But a carefully taken clinical history, a painstaking one elicited not at one but at repeated sittings, may lead us to the correct diagnosis. The real incidence and sequence of symptoms is of great importance. A recent article by R. R. Graham[2] has taken up this subject so thoroughly that it would be presumption for me to do more than to recommend it to you for your consideration. It provides a first-rate argument for the importance of history-taking in the training of our house pupils, who, outside the hospital walls, may find themselves without laboratories and without instruments of precision, but who need never be without observing eyes, skillful fingers, inquisitive tongues, and logical, orderly minds.

Treatment. The best, the most satisfactory treatment is preventive; by the term "preventive treatment" here I mean the application of the proper therapeutic procedure before the local pathological changes incident to biliary infection have reached an advanced stage, before stones have formed, if possible, before the gall-bladder itself is infiltrated with the inflammatory exudate. This, I know, is visionary and quite impossible with our present knowledge, but nevertheless, it is ideal, and the ideal is what we should try to attain. I fear, however,

that as in the past most of our work in the way of treatment will have to do with cases in which the pathological process is more or less advanced. Even in that event, we can still aim at preventing future trouble by applying the proper procedure to the pathology presented and by eradicating the original focus of infection. The latter, of course, will not always be possible, since there are certainly hidden infective foci which we cannot hope to uncover.

With the knowledge we have at hand today, the only logical treatment of biliary infections is that afforded by surgery. It may not be ideal, it may not always be entirely satisfactory, but it is surely the best that the present can offer. It is possible that in time the physiologic drainage of the gall-bladder, which has been proposed by Vincent Lyon of Philadelphia, will develop outside the position which it holds today—a possible means of early diagnosis in the hands of an expert user, a possible agent of relief in so-called catarrhal jaundice. But it cannot take the place of a sound surgery in the treatment of gall-bladder infections; it cannot remove an exudate from a thickened, infiltrated bladder-wall nor prevent the pernicious effects of such an infection. As far as the treatment of real biliary infection is concerned, it occupies quite the same position as the so-called medical incision in the treatment of spreading cellulitis in the superficial parts; it is elegant but ineffective. This is the age of "something new"; the times are prone to ascribe to novelties wonderful powers which are seldom realized in fact. I admit that it is through "something new" that progress is made, but nevertheless every new procedure that is proposed should be measured by common-sense standards, and only when the measurement is convincing should the forward step be taken.

The question of the proper surgical procedure to be applied to the various pathological conditions caused by infection of the biliary tract has not yet been definitely settled in its entirety. Numerous articles on cholecystectomy *versus* cholecystostomy, on the technic of drainage of the common duct, on the problem as to whether the gall-bladder should be removed from below upward or from above downward are found in the professional journals. Many of the problems must be solved by the individual operator for himself; he must consider his own ability and must weigh the systemic, the anatomical and the pathological conditions offered by the individual case as he meets it. He must read and ponder and shape his course along ways he feels he is best prepared to follow.

Though certain pathological conditions and certain individual circumstances may make cholecystostomy advisable at times, yet the weight of the best surgical opinion of today is on the side of cholecystectomy as the routine measure. The end-result—and that is the best measure of the worth of an operative procedure—following cholecystectomy seems to be better. Unsatisfactory results sometimes follow either procedure; those after cholecystectomy are almost always due to operative trauma or to operative technical errors; those following cholecystostomy, to pathological conditions which should have been eradicated. Yet, cholecystectomy is by no means a simple, danger-free operation; it is far from fool-proof. I always approach it very respectfully and some of my most serious operative sins in this field have been committed in cases where I had made a very clear demonstration of anatomical conditions and had thought I had plain sailing. Care, care, and still more care, is our only safeguard.

Of what should be done in the presence of pancreatitis, Dr. Jones has spoken.

On the question of the technic of drainage of the common duct much might be said. The natural drainage is through the papilla into the duodenum. When that way can safely be used, use it, because, as with all other mucus-lined channels, incision and operative trauma applied to the common duct may be followed by stricture. If you are sure that the stones have been removed and that the path for the bile into the intestine is unimpeded, suture carefully the operative opening in the duct and place a small drain in the pouch below it; do not drain down *to* it or you sin against the code of good surgery.

For the same reason (possible stricture following operative opening) I believe the method of draining the common duct by passing a catheter through the stump of the cystic duct, should have much consideration. I am sure, however, that the introduction of such a catheter is sometimes a matter of difficulty.

The surgery of biliary infections is a field that should be held in much respect. The occasional operator should enter it only in cases of emergency. Even the most experienced surgeon may have his skill and judgment taxed to the utmost, because in no other abdominal field may the pathological processes be more widespread and varied and the anatomical relations more important and involved.

REFERENCES.

1 Rosenow: Surg., Gyn., and Obstet., Vol. xxxiii, No. 1.
2 Graham, R. R.: Arch. of Surg., Vol. iii, No. 1.
3 Deaver: Surg., Gyn., and Obstet., October, 1917.
4 Kelling: Archiv. für Verdauungs-Krankheiten, Berlin, Vol. xxviii, No. 2.
5 Graham: Surg., Gyn., and Obstet., Vol. xxvi, pp. 521-537.
6 Judd, E. S.: Jour. A. M. A., 1921, Vol. lxxvii, No. 3.
7 Murphy, J. B.: Clinics, Vol. ii, No. 6, p. 1052.

Announcement of meetings to be held on and after next Thursday should reach the desk of the Editor of the JOURNAL not later than next Saturday before noon. The printers do not work Saturday afternoon and the material is locked up in the forms on Monday, and goes to press Tuesday morning. The wrapping and mailing begins Wednesday. Please forward copy early.